216331-000 rev4

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*Read carefully for proper installation and operation.*

# INSTALLATION INSTRUCTIONS

## INDUSTRIAL IMMERSION HEATERS FOR HAZARDOUS LOCATIONS



## BEFORE YOU INSTALL

**⚠ WARNING**

**Explosion hazard:** Do not open heater element enclosure when an explosive atmosphere is present.

**Fire or explosion risk:** If the heater element is not equipped with a high temperature limit switch or thermostat, a temperature control must be added. Uncontrolled heating may result in fire or explosion.

**Flameproof joints:** Do not attempt to repair flameproof joints. Incorrectly repaired joints may be compromised. Contact Hotstart for flameproof joint details.

**Sealing fittings:** To reduce the risk of ignition in hazardous atmospheres, conduit runs must have a sealing fitting connected within 18 inches of the enclosure (North America only).

**⚠ WARNING**

**Hazardous voltage:** Before wiring, servicing or cleaning the heating system, turn off the power and follow your organization's lockout and tagout procedure. Failure to do so could allow others to turn on the power unexpectedly, resulting in harmful or fatal electrical shock.

**Personal injury:** Disconnect power supply before performing any electrical work. Wiring must be performed by a trained technician and in accordance with national and local electrical codes. (Reference directive 2014/34/EU in EU countries.)

**⚠ CAUTION**

**Hot surfaces:** Hot surfaces are a potential injury hazard. Use caution when working on or around the heater. Allow heater to cool before removing or servicing.

**Ignition hazard:** To reduce the risk of ignition of hazardous atmospheres, disconnect heater from supply circuit before opening enclosure. Keep enclosure tightly closed during operation.

**NOTICE**

**Liquid level switch**: On applications where level of fluid is subject to change, Hotstart requires installing a user-supplied liquid level switch mounted a minimum of 3 to 4 inches (8 to 10 cm) above the element. An approved liquid level control must be provided as described in the caution label on the heater enclosure.

**Contactors and transformers:** To complete installation, single-phase heaters require a contactor if the thermostat's amperage limit is exceeded and a control transformer if the thermostat's voltage limit is exceeded. Three-phase heaters rated for up to 240 volts require a contactor; three-phase heaters rated for over 240 volts will require a contactor and transformer.

## INDUSTRIAL IMMERSION HEATERS

Hotstart industrial immersion heaters are designated for use in hazardous locations (Class I, Group D). Depending on your heater's specifications, it may connect to your equipment using threaded design or using a threadless V-clamp and weldable adapter.

**Certifications:**

Class I Div. 1 Group C & D T3A

Class I Zone 1 Group IIB T3

IECEx UL 18.0071X DEMKO 18 ATEX 1943X ⟨Ex⟩II 2 G Ex db IIB T3 Gb & Ex db IIB T3 Gb CE 0539 Ambient temp. -40 °C +40 °C IP66 NEMA Type 4

**Standards used for certifications:**

- UL 823, Ninth Edition, revision date: 2021-01-11
- CSA C22.2 No. 30-M1986, reaffirmed 2016
- IEC 60079-0:2017 and Corr. 1:2020
- IEC 60079-1:2014
- EN IEC 60079-0:2018
- EN 60079-1:2014

| | |
|---|---|
| Max/ Min. process fluid temp. | 0 °C to 80 °C |
| Ambient temp. | -40 °C to 40 °C |
| Pressure rating | 350 psi (2.41 mPa) |
| Voltages | 120 to 575 V AC, 50/60 Hz, 1/3 phase |
| Wiring entries | All wiring entries are 1.0" NPT and shall be terminated with a listed fitting. Wiring entries shall be terminated with a potted and listed fitting within 18" of the enclosure (North America only). Plugs shall be IECEx and ATEX Ex db IIB Gb and UL/cUL Class I, Div I, Group C & D. |

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# INSTALLING THE IMMERSION HEATER

**NOTICE**

**Overheating hazard:** Do not install the immersion heater above the minimum fluid level. A heater element that is not completely submerged can cause overheating and damage the fluid.

**Improper installation:** Hotstart recommends installing the immersion heater in the sides or bottom of a tank or sump. Installing the heater at the top of a tank or sump may cause a change in the fluid level to expose the element to air, causing overheating and damage to the heater and fluid.

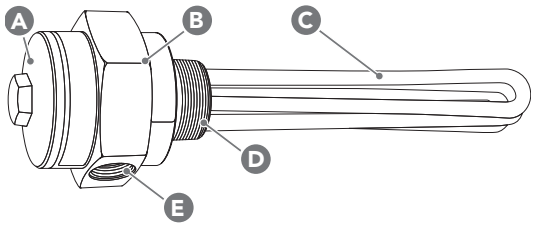


*Figure 1. Typical Class I, Group D industrial immersion heater rated for use in hazardous locations, showing cover* **(A)**, *element enclosure* **(B)**, *element* **(C)**, *threaded plug* **(D)**, *and wiring entrance* **(E)**. *Immersion heater may vary, see Fig. 2 for threadless, V-clamp style.*

1. Drain sump or tank.
2. Select tank or sump port based on your heater element length and thread size (threaded plug models) or element adapter size (threadless, V-clamp models). **NOTICE!** To prolong element life, avoid installations in locations where the heating element may come in contact with sludge and debris, typically at or near the bottom of a tank.
3. Install immersion heater:

➤ For threaded plug models *(See Fig 1.)*:

1. Apply pipe compound to threaded plug **(D)** to protect threads from damage during installation.
2. Insert heater element and screw threaded plug **(D)** into port.

   **NOTE:** Hotstart recommends tightening the element assembly to port hand tight plus 1-1/2 to 2-1/2 additional turns as necessary to prevent leaks.

➤ For threadless, V-clamp models *(See Fig. 2)*:

1. Center weldable adapter **(D)** on port. Weld adapter in place.

   **NOTE:** Port minimum diameter should be 2-1/2 inches (63 mm); maximum diameter should be 2-3/4 inches (69 mm).

   **NOTE:** Protect surfaces from weld spatter. Hotstart recommends stainless steel weld wire. Weld per local applicable welding code.
2. Slide O-ring **(C)** over element. Slide V-clamp **(B)** over element.
3. Insert element into port. Slide V-clamp **(B)** over weldable adapter **(D)** and element adapter **(A)**. Ensure O-ring **(C)** is in place.

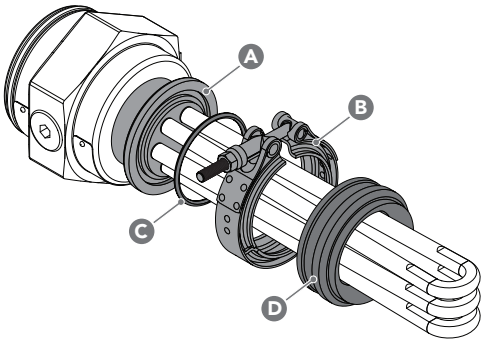


*Figure 2. Industrial immersion threadless, V-clamp assembly components, showing element adapter* **(A)**, *V-clamp* **(B)**, *O-ring* **(C)**, *and weldable adapter* **(D)**.

4. Tighten V-clamp screw to secure heater to port.

   **NOTE:** To avoid leaks, Hotstart recommends tightening the V-clamp screw to 15 lbf · ft (20 N · m).

# WIRING THE IMMERSION HEATER

**⚠ CAUTION**

**Personal injury:** Disconnect power supply before performing any electrical work. Wiring must be performed by a trained technician and in accordance with national and local electrical codes.

**Electrical hazard:** The heater must be connected to a suitable protective earthing conductor. The heater's power supply must be connected to a suitable overcurrent limiting device. A means of disconnection from power supply is required. Hotstart recommends that a power switch or circuit breaker be located near the heater for safety and ease of use. Reference markings on heater for specific ratings.

**Overheating hazard:** Terminals in all enclosures require wire rated for a minimum of 90 °C. Selected wire must be sized in accordance with heater amperage. *See Table 1.*

| AWG | AMPACITY |
|---|---|
| 14 | 20 A |
| 12 | 25 A |
| 10 | 35 A |
| 8 | 50 A |

*Table 1. AWG wire sizing. Reference NEC 2017 Table 310.15(B)(16) for conductor ampacity.*

**Grounding conductor:** Equipment grounding conductors shall be sized per NEC 2017 Table 250.122 for US installations. For international installations, use IEC 60079-0, Clause 16. Ground stud will accept 14–8 AWG conductors. External grounding connection not provided. Metallic conduit or armored cable must be used. Wiring systems shall comply with 15.1.2 b) of IEC 60079-0.

**NOTICE**

**Electrical enclosure:** The electrical enclosure must remain covered to protect terminals from moisture and vapor.

## WIRE THE ELEMENT

1. Remove element enclosure cover. Note your heater's element configuration. *See Fig 4 on following page.*
2. Unscrew plug from wiring entrance.
3. Connect appropriate conduit, cord connections, and cable connectors to wiring enclosure.

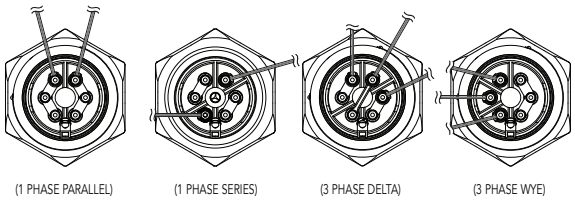


*Figure 4. Immersion element configurations.*

4. Connect power source conductors to element posts. Using supplied washers and nuts, tighten electrical connections.

   **NOTE:** Hotstart recommends tightening electrical connections to 14 lbf · in (158 N · cm).

## CONNECT WIRING COMPONENTS

1. Depending on your immersion heater's configuration, you may be required to install a control transformer or contactors. *See Table 2.*

| THERMOSTAT | VOLTS | AMP LIMIT | CONTACTOR REQUIRED |
|---|---|---|---|
| Fixed | 120 V | 15 amps | >1.8 kW |
| Fixed | 208 V | 10 amps | >2.0 kW |
| Fixed | 240 V | 10 amps | >2.4 kW |
| Fixed | 277 V | 7.2 amps | >2.0 kW |

*Table 2. Thermostat amperage and voltage limits.*

- If your immersion heater is **single-phase,** determine if your heater requires a contactor or contactor and transformer to complete installation (*see Table 1).*
  - If your thermostat's voltage rating and amperage limit are not exceeded, neither a contactor nor a transformer are required *(see Fig. 5).*
  - If your heater's voltage exceeds your thermostat's voltage rating, a control transformer and contactor are required (*see Fig. 6).*
  - If your heater's wattage exceeds your thermostat's amperage limit, a contactor is required (*see Fig. 7*).
- If your immersion heater is **three-phase** *and* **rated for over 240 volts**:
  - A user-supplied control transformer and contactor are required to complete your heater's installation. *See Fig 6.*
- If your immersion heater is **three-phase** *and* **rated for 240 volts or less**:
  - A user-supplied contactor is required to complete your heater's installation. *See Fig 7.*

2. Install a user-supplied liquid level switch at or above the level of the immersion heater. Wire the liquid level switch to ensure the heater will be de-energized in the event the liquid drops to or below the level of the element.
3. If your immersion heater is not equipped with an included high-limit thermostat or a resistance temperature device (RTD), a user-supplied temperature control must be installed.

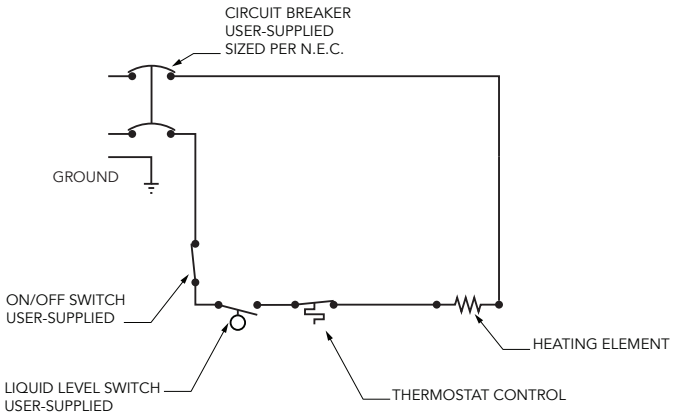


*Figure 5. Wiring schematic without user-supplied contactor or control transformer. This schematic applies to single-phase heaters that do not exceed the thermostat's amperage and voltage limit.*

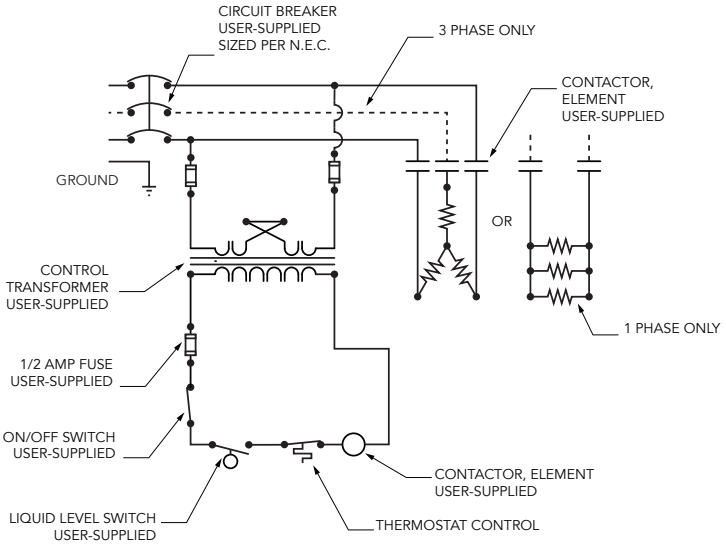


*Figure 6. Wiring schematic showing element contactor and transformer with control circuit. This schematic applies to single-phase heaters that exceed thermostat voltage and amperage limits. This schematic also applies to three-phase heaters rated for over 240 volts.*

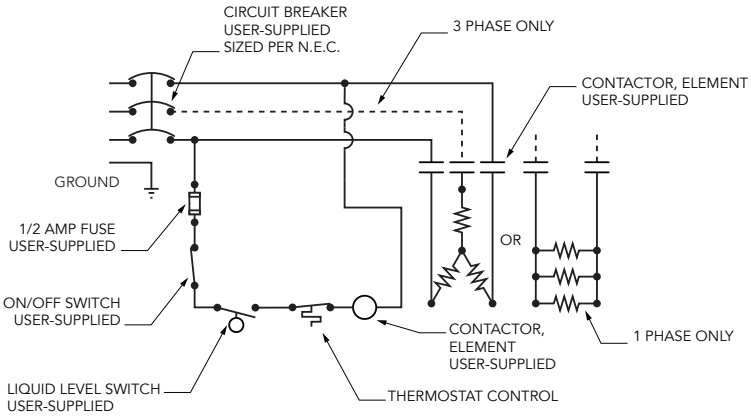


*Figure 7. Wiring schematic showing element contactor with control circuit. This schematic applies to single-phase heaters that exceed thermostat amperage limits but fall within thermostat voltage limits. This schematic also applies to three-phase heaters rated for 240 volts or less.*